REMARKS/ARGUMENTS

Applicants wish to thank the Examiner for the interview conducted on 1/25/2005, where a tentative agreement was reached with respect to patentable claims over the prior art of record, although the Examiner stated that an additional search may likely be necessary. The interview was conducted via telephone and attended by Examiner My Chau T Tran, and Applicants representatives William R. McCarthy, and Philip L. McGarrigle. The subject matter of the interview included discussion of the structural rotatable elements added to the claims by amendment and the support in the written description of each rotatable element. Interpretation of the meaning of terms with respect to linear versus circular motion and support in the specification for circular movement of each rotatable element was also discussed, as well as amendments made to respond to the rejection asserting the use of functional language in the claims. Applicants would like to reiterate that the interview was found to be very helpful in advancing the prosecution of the present application.

Applicants assert that no new matter is presented by these amendments as shown below, and respectfully request entry of the same. Upon entry of this amendment, claims 5-22 are pending and of these, claims 5 and 22 are independent. No new claims have been added.

Applicants have amended claims 5 and 22 to provide clarity to the structure that enables circular movement of deposit elements around a plurality of axes. Firstly, Figure 2 provides an illustrative example of the complete assembly of print head 140 that comprises each of the rotatable elements described below operatively coupled to the deposit pins 430. Also, specific description of the structural components of print head

140, including each of the rotatable elements and deposit pins may be found in paragraph [0041] *et seq.*

In particular, the first mounting assembly has been amended to comprise a first rotatable element that permits the deposit elements to rotate around a first axis (for support see paragraph [0043] and Figures 3-4, head mounting plate 212). As discussed in the interview, head mounting plate 212 is described as enabled to rotate "in a circular motion" around an imagined central axis. Also, the positional relationship of head mounting plate 212 to deposit pins 430 and central axis 410 is illustratively shown in Figure 4.

Similarly, the second mounting assembly has been amended to comprise a second rotatable element that permits the deposit elements to rotate around a second axis (for support see paragraph [0047] and Figure 5, pin and ring motor mount plate 226). As discussed in the interview, roll direction arrow 500, as illustrated in Figure 5, indicates the circular rotation of pin and ring motor mount plate 226 in a roll direction around an axis that is parallel to slide 206 (refer to Figure 2 for slide 206). Further, pin and ring motor mount plate 226 is described in paragraph [0047] to rotate in the roll direction indicated by arrow 500 and in particular to "rotate with relation to plate 212".

Also, the third mounting assembly has been amended to comprise a third rotatable element that permits the deposit elements to rotate around a third axis (for support see paragraph [0048], plate 218). As discussed in the interview, pitch direction arrow 700, as illustrated in Figure 7, indicates the circular rotation of plate 218 in a pitch direction around an axis that is parallel to slide 206 (refer to Figure 2 for slide 206). Additionally, the rotation of plate 218 is described in paragraph [0048] to rotate in the pitch direction

indicated by arrow 700 and more particularly as follows: "a controlled rotation of plate 218 relative to fixed (in this direction of movement) plate 216".

Therefore, Applicants respectfully assert that each of the rotatable elements associated with the first, second, and third mounting assemblies clearly define the claimed structure that permits rotation of the deposit around their respective axes.

Claims 8, 9, and 16 have also been amended to provide consistency with claims 5 and 22, and clarity to the circular rotation of elements around a plurality of axes.

Applicants respectfully assert that the claims as amended address each of the Examiners points presented in the "Response to Arguments" of the Office Action dated 9/15/2004. In particular, Applicants respectfully assert that the claims as amended clearly claim the circular rotation of the deposit elements permitted by each of the rotatable element and are distinguished in terms of structure rather than function.

Reply to Claim Rejections – 35 U.S.C. §102(b)

The Examiner has maintained the rejections under 35 USC §102(b) of claims 5-6, 10-13, and 22 by Ackey et al. (US Patent 5,733,509); claims 5-22 by Brown et al. (US Patent 5,807,522); and claim 22 by Roach et al. (US Patent 5,770,151).

Applicants respectfully repeat the assertion filed in the response of May 28, 2004 that Ackey et al., Brown et al., and Roach et al. each teaches linear movement of elements for printing operations, and do not describe or suggest the rotational movement of deposit elements around an axis. As described above, Applicants have amended claims 5 and 22 to clearly claim mounting assemblies that each comprise a rotatable element and permit the circular movement of deposit elements around a first, second, and

third axis. Applicants respectfully assert that neither Ackey et al., Brown et al., or Roach et al. teach or suggest any rotatable element structure that defines an axis of rotation of the deposit elements. Also, neither Ackey et al., Brown et al., nor Roach et al. describe any type of circular movement of deposit elements around an axis.

For example, Ackey et al. discloses a plurality of dispensing bars each having a plurality of dispensing heads, where each dispensing bar is fixedly positioned in an axis parallel to one another (Ackey et al. Col.2, line 40 *et seq.*; and Figure 1, dispensing bars 14, 20, 26, 32, respectively arranged along linear axes 18, 24, 30, 36). Further, Ackey et al. discloses a positioning mechanism provides translation of the substrate or the plurality of dispensing bars along a linear axis (Figure 1, axis 54) in Col. 3, line 52 *et seq.* that states:

> "In one embodiment, the positioning mechanism 52 includes a translation table or other like conveying apparatus which translates the substrate 10 along an axis 54 transverse to each respective axis of the plurality of dispensing bars 12. In an alternative embodiment, the positioning mechanism 52 translates the plurality of dispensing bars 12 along the axis 54 while the substrate 10 is fixed."

Continuing with the present example, Brown et al. discloses a structure that linearly moves a dispenser (i.e. deposit element) toward and away from a support surface (i.e. substrate) (Figure 1 solenoid 22, and solenoid piston 24 and Figure 4 elements 72 and 76) as stated in Col. 7, line 17 et seq.:

> "In the embodiment shown, this structure includes a solenoid 22 which is activatable to draw a solenoid piston 24 rapidly downwardly, then release the piston, e.g., under spring bias, to a normal, raised position, as shown. The dispenser is carried on the piston by a connecting member 26, as shown."

Also Brown et al. discloses a positioning support that further includes a displacement assembly (Figure 4, displacement assembly 86) that linearly moves the dispenser device along the x-axis and a displacement assembly that linearly moves the dispenser along the y-axis. Each of the displacement assemblies includes a rotatable "worm screw", but the rotation of each worm screw defines the linear movement of the dispenser along the X or Y axis as stated with respect the X axis movement in Col. 10, line 7 et seq.:

> "The dispenser device is carried on an arm 74 which is threadedly mounted on a worm screw 80 driven (rotated) in a desired direction by a stepper motor 82 also under the control of unit 77. At its left end in the figure screw 80 is carried in a sleeve 84 for rotation about the screw axis. At its other end, the screw is mounted to the drive shaft of the stepper motor, which in turn is carried on a sleeve 86. The dispenser device, worm screw, the two sleeves mounting the worm screw, and the stepper motor used in moving the device in the "x" (horizontal) direction in the figure form what is referred to here collectively as a displacement assembly 86."

and with respect to Y axis movement in Col. 10, line 28 et seq. that states:

> "The displacement assembly, in turn, is mounted for movement in the "y" (vertical) axis of the figure, for positioning the dispenser at a selected y axis position."

Still continuing with the present example, Roach et al. discloses a pod that facilitates linear movement of a capillary collection and deposition device (Figure 1, element 10) (i.e. deposit element) in the Z direction, an arm that when associated with the pod facilitates linear movement in the X direction, and a cross member that when associated with the pod facilitates linear movement in the Y direction (Figure 1 provides a spatial reference for each of the linear X, Y, and Z axes) as stated in Col. 3, line 45 *et seq.*:

> "The work-station includes a pod 14, an arm 16 and a cross-member 18. Arm 16 has a longitudinal axis extending parallel to an X axis, with pod 14 movably connected thereto. Pod 14 facilitates movement of capillary device 10 along the Z direction. Movement of capillary device 10 along the X direction is achieved by pod 14 moving along the longitudinal axis of arm 16. Movement along the Y direction is achieved by arm 16 being movably mounted to a cross-member 18, which has a longitudinal axis extending parallel to the Y direction."

In the example presented above each of the references are directed to linear movement of the deposit elements and none describe the circular movement of deposit elements around an axis, and in particular circular movement of the deposit elements around 3 axes of rotation.

Also in the Final Office action mailed 9/15/2004, the Examiner neither maintained nor withdrew the previous rejection under 35 USC §102(b) of claims 5-6, 10-12, and 22 by Hayes et al. (US Patent 5,658,802). Applicants respectfully repeat the assertion filed in the response of May 28, 2004 that Hayes et al. teaches linear movement of elements for printing operations, and does not describe or suggest the circular movement of deposit elements around an axis. For example, Hayes et al. discloses a first and a second position support system that causes relative movement between the ejection devices and the substrate (Hayes et al. Col. 4, line 59 *et seq.*). Additionally, Hayes et al. describes the linear motion (i.e. along the X and Y axes) of first and second positioning system in Col. 7, line 65 *et seq.* that states:

> "The arrangement of FIG. 3 operates similarly to that illustrated in FIG. 1 except that the controller and drive electronics operate both a first and a second positioning system 84a and 84b. Each drop issued from the ejection devices is accurately positioned on the substrate at a known location by moving the ejection devices on the Y axis and by moving the substrate on the X axis."

As provided in the examples, each of the references discussed above simply describes linear (i.e. along an axis or in a straight line) movement of deposit elements such as, for example, the linear Up/Down movement of the deposit elements towards and away from a substrate, or "side to side" and "back and forth" linear movement of the deposit elements in an X/Y axis relative to a planar substrate. Such linear movement is different than the presently claimed invention of circular movement of the deposit elements around multiple axes that provides fine positional control of the interaction of the deposit elements with the substrate such as, for instance, rotation of the print head to insure that the additional Z-axis movement (i.e. the Up/Down movement when depositing features) of the deposit elements is perpendicular to the plane of the substrate, or rotation of the print head to insure that the deposit elements are properly positioned with respect to an area defined by the boundaries of the substrate. Such fine positional control provided by the ability to rotate the deposit elements around 3 axes allows for positional manipulation that could for instance be used to compensate for error that could be caused by mechanical wear, use of lower grade components, substrate variations, component replacement, or other sources of error.

Therefore, Applicants respectfully assert that each of claims 5-22 is patentable.

Further, each of claims 6-21 depends from claim 5 in their chain of dependency, and thus each of claims 6-21 are also patentable.

Reply to Claim Rejections – 35 U.S.C. §102(e)

The Examiner has also maintained the rejections made under 35 USC §102(e) of claim 5-12, and 14-22 by Wang (US Patent 6,511,849 B1).

Similar to the rejections made under 35 USC §102(b), applicants respectfully reiterate the assertion filed in the response of May 28, 2004 that Wang teaches the use of a first, second and third linear guides that do not provide rotational movement of deposit elements around an axis, rather each provides linear movement of the deposit elements. Applicants also direct the Examiners attention to the disclosure in Wang of a sampling manifold comprising sampling needles that "pivots" between an up position and down position (Col. 4. line 4 *et seq.*; Figures 1 and 3, sampling manifold 9, and sampling needles 8). Thus, Applicants assert that Wang only teaches a single rotatable element structure that defines an axis of rotation of deposit elements around a single axis.

For example, Wang discloses a first linear guide, a second linear guide, and a third linear guide, where the third linear guide is perpendicular to the first and second linear guides, and further where the first linear guide is perpendicular to the second linear guide (Wang Col. 3, line 24 *et seq.*; and Figure1 horizontal linear guide 2, second horizontal linear guide 3, and third linear guide 4). Wang discloses the linear movement provided by each of the guides in Col. 3, line 55 *et seq.* that states:

> "A third linear guide 4 is attached to the second linear guide 3 by means of the carriage such that the third linear guide 4 is substantially perpendicular to the first linear guide 2 and the second linear guide 3. By means of the computer controlled motor 5b, the third linear guide 4 can be moved back and forth by the carriage along the axis of the second linear guide 3. A drive mechanism within the third linear guide 4, e.g. a lead screw that is meshed with the carriage, enables the third linear guide 4 to be moved vertically by a further computer controlled motor 5c and positioned in any desired vertical location within the range of movement. Computer control is achieved by connection of motor 5a to an amplifier 17 which is connected to the motion control board 28. Use of linear guide 2, linear guide 3, linear guide 4 and the three carriages, thus provides for motion in three dimensions."

Further, Wang discloses the rotational movement of the sampling manifold comprising sampling needles in Col. 4. line 12 *et seq.* that states:

> "As shown in FIG. 3 in solid lines the sampling manifold 9 is in the "down" position, for sampling (and cleaning). When the third linear guide 4 is being re-positioned the sampling manifold is pivoted to the "up" position as shown by the broken lines."

As previously discussed with respect to the rejections under 35 USC §102(b), the movement of the deposit elements provided by the linear guides is different than the circular movement around 3 axes provided by the claimed invention. Also, Wang only discloses a single rotatable element structure and correspondingly only describes rotation of the deposit elements around a single axis that falls short of the 3 rotatable element structures and corresponding 3 axes of rotation provided by the claimed invention. The 3 axes of rotation provided by the claimed invention provide greater versatility with respect to positional control of the deposit elements than a single axis of rotation.

Applicants respectfully assert that claims 5 and 22 as amended clearly claim mounting assemblies that permit the rotation of deposit elements around 3 axes of rotation.

Therefore, Applicants respectfully assert that each of claims 5-22 is patentable.

Further, each of claims 6-12, and 14-21 depends from claim 5 in their chain of dependency, and are thus patentable.

CONCLUSION

As stated above, Applicants have amended the present claims to show circular rotation of a first, second, and third rotatable element each around their respective axes.

As discussed in the telephonic interview, the Examiner has indicated that this quality would distinguish over the art. For this reason, Applicants believe all pending claims are now in condition for allowance. If the Examiner has any further questions pertaining to this application or feels that a telephone conference would in any way expedite the prosecution of the application, she is encouraged to call the undersigned at (781) 280-1522.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account 01-0431.

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

By _____

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